

Serial No.: 10/089,888 (PCT/JP00/07011)

IN THE CLAIMS:

Please cancel claims 36 to 40 without prejudice or disclaimer.

Please amend claims 3, 8, 17 to 35, 41 to 59, 65, 68 to 86, 88 and 90 as follows:

3. (Amended) The method for manufacturing a liquid crystal element according to claim 2, wherein the vibration sub-step is an ultrasonic/megasonic irradiation vibration sub-step using ultrasonic or megasonic waves for the vibration applied to the sealing resin.

8. (Amended) A liquid crystal element, in which liquid crystal is held by two substrates above and below it in a space enclosed by a wall,

wherein, in a portion that seals the space after filling liquid crystal into it, a resin is used that has a viscosity of not more than 20 Pa·s at a predetermined temperature of at least 40°C when it is uncured and that can be cured by electromagnetic waves; and

wherein the cured resin does not include optically foreign matter, such as water, air or dust.

17. (Twice Amended) The liquid crystal element according to claim 13, wherein the neutralization electrode contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

18. (Amended) The liquid crystal element according to claim 16, wherein the neutralization electrode contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

19. (Amended) An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are not provided, a light-blocking film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, and wherein the light-blocking film contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

20. (Amended) An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are provided, a light-blocking film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the light-blocking film contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

21. (Amended) An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are not provided, a neutralization electrode of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the neutralization electrode with protrusion/recesses in its surface contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

22. (Amended) An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are provided, a neutralization electrode of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the neutralization electrode with protrusion/recesses in its surface contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

23. (Amended) An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, an opposing substrate in which an opposing electrode is formed in opposition to the pixel electrode, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates, wherein an alignment of the liquid crystal molecules is changed by applying a voltage between the pixel electrode, the common electrode and the opposing electrode;

wherein the opposing electrode has a liquid crystal layer side surface of a structure with protrusions/recesses, and moreover this

Serial No.: 10/089,888 (PCT/JP00/07011)

surface of a structure with protrusions/recesses contacts the liquid crystal layer directly, via a thin film not thicker 500 Å, or via a film that is transmissive to ions.

24. (Amended) An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, an opposing substrate in which an opposing electrode is formed in opposition to the pixel electrode, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates, wherein an alignment of the liquid crystal molecules is changed by applying a voltage between the pixel electrode, the common electrode and the opposing electrode;

the liquid crystal element comprising, on an opposing substrate side on which the pixel electrode, etc., are not formed, a light-blocking film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the surface of the light-blocking layer with protrusions/recesses contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

25. (Amended) An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, an opposing substrate in which an opposing electrode is formed in opposition to the pixel electrode, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates, wherein an alignment of the liquid crystal molecules is changed by applying a voltage between the pixel electrode, the common electrode and the opposing electrode;

Serial No.: 10/089,888 (PCT/JP00/07011)

the liquid crystal element comprising, on an opposing substrate side on which the pixel electrode, etc., are formed, a light-blocking film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the surface of the light-blocking layer with protrusions/recesses contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

26. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 19, wherein the light-blocking film is made of a conductive resin-based substance.

27. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 19, wherein the liquid crystal layer uses a liquid crystal with a specific resistance of 10^{12} to $10^{13} \Omega \cdot \text{cm}$.

28. (Amended) The in-plane electric field mode liquid crystal element according to claim 26, wherein the liquid crystal layer uses a liquid crystal with a specific resistance of 10^{12} to $10^{13} \Omega \cdot \text{cm}$.

29. (Amended) A color filter used in a display device in which a liquid crystal is driven in in-plane electric field mode; wherein a surface of a light-blocking film portion on a liquid crystal layer side has a structure with protrusions/recessions, and the surface of the structure with protrusion/recessions contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

30. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 19, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.1 μm .

31. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 19, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.3 μm .

32. (Amended) The in-plane electric field mode liquid crystal element according to claim 26, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.3 μm .

33. (Amended) The in-plane electric field mode liquid crystal element according to claim 27, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.3 μm .

34. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 21, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the neutralization electrode is at least 0.1 μm .

35. (Amended) The in-plane electric field mode liquid crystal element according to claim 27, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.3 μm .

41. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the pixel electrodes, an insulating layer for insulation, etc., of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to gates, and acting to neutralize ions generated in the liquid crystal.

42. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the pixel electrodes, an insulating layer for insulation, etc., of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to the pixel electrodes, and acting to neutralize ions generated in the liquid crystal.

43. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the pixel electrodes, an insulating layer for insulation etc. of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to opposing electrodes, at least of portion of which contact the liquid crystal layer directly, via an orientation film not thicker than 500 Å, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

44. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the pixel electrodes, an insulating layer for insulation etc. of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to at least one of scanning signal lines or gate signal lines, and acting to neutralize ions generated in the liquid crystal.

45. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source and gate signal lines as conductive layers, as well as pixel electrodes and common electrodes for generating an in-plane electric field, and further including an insulating film ensuring insulation or the like among these conductive layers; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises a region made into a thin film, in which the total thickness of a film forming a third layer made of the insulating film and an orientation film arranged between the conductive layers and the liquid crystal layer is not more than 500 Å.

46. (Amended) The in-plane electric field mode liquid crystal element according to claim 45, wherein the region made into a thin film is located on at least one of the orientation film and the insulating film.

47. (Amended) The in-plane electric field mode liquid crystal element according to claim 45, wherein the region made into a thin film is on the orientation film or a protective film, and the orientation film or the protective film is made of a resin-based conductive material.

48. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 45, wherein the region made into a thin film is located on the pixel electrodes, the common electrodes or the signal lines.

49. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 45,

wherein the in-plane electric field mode liquid crystal element includes a resin-based conductive light-blocking film; and

the region made into a thin film is located on the conductive light-blocking film.

50. (Amended) The in-plane electric field mode liquid crystal element according to claim 49, wherein the region made into a thin film is formed on a substrate opposing the substrate on which the pixel electrodes are formed.

51. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, as conductive layers, signal lines, storage capacity electrodes, and pixel electrodes and common electrodes for generating an in-plane electric field, and an insulating film for insulating, etc., these conductive layers from one another; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein a film forming a third layer made of the insulating film and the orientation films, etc., arranged between the conductive layer and the liquid crystal is, in a predetermined location, only the orientation film of a film thickness of not more than 500 Å, a thin film of not more than 500 Å, a film transmissive to ions, or has not been formed in the first place.

52. (Amended) The in-plane electric field mode liquid crystal element according to claim 51, wherein the predetermined location at which the liquid crystal layer and the conductive layer are in direct contact is on the pixel electrodes, the common electrodes, the storage capacity electrodes, or the signal lines.

53. (Amended) The in-plane electric field mode liquid crystal element according to claim 51, wherein the in-plane electric field mode liquid crystal element comprises a resin-based conductive light-blocking film, and the predetermined location at which the liquid crystal layer and the conductive layer are in direct contact is on the conductive light-blocking film.

54. (Amended) The in-plane electric field mode liquid crystal element according to claim 53, wherein the region the region made into a thin film is formed on a substrate opposing the substrate on which the pixel electrodes, etc., are formed.

55. (Amended) An in-plane electric field mode liquid crystal element, comprising:

a pair of substrates including, on one of the substrates, pixel electrodes, as well as opposing electrodes and signal lines not on the same layer as the pixel electrodes, and an insulating film for insulating, etc., these from one another; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the insulating film is formed on either the pixel electrodes or the opposing electrodes, and is not formed at all on the other of the two.

56. (Amended) The in-plane electric field mode liquid crystal element according to claim 55, wherein the insulating film is formed along the direction of rubbing in the in-plane electric field mode liquid crystal element.

57. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 45, wherein the in-plane electric field mode liquid crystal element uses a liquid crystal with a specific resistance of 10^{12} to $10^{13} \Omega \cdot \text{cm}$.

58. (Amended) The in-plane electric field mode liquid crystal element according to claim 50, wherein the in-plane electric field mode liquid crystal element uses a liquid crystal having a specific resistance of 10^{12} to $10^{13} \Omega \cdot \text{cm}$.

Serial No.: 10/089,888 (PCT/JP00/07011)

59. (Amended) The in-plane electric field mode liquid crystal element according to claim 54, wherein the in-plane electric field mode liquid crystal element uses a liquid crystal having a specific resistance of 10^{12} to $10^{13} \Omega \cdot \text{cm}$.

65. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates, in which on one of the substrates is formed pixel electrodes and common electrodes, and signal lines and scanning lines corresponding to the pixel electrodes and the common electrodes;

wherein liquid crystal is sandwiched via orientation films provided on the inner side of the two substrates;

Serial No.: 10/089,888 (PCT/JP00/07011)

wherein the in-plane electric field mode liquid crystal element comprises, on the other substrate, a conductive light-blocking film extending in the direction of the signal lines and the direction of the scanning lines, and there are regions, arranged in a grid, that are in contact with the liquid crystal layer via a thin film layer of not more than 500 Å or a film transmissive to ions arranged.

68. (Amended) The in-plane electric field mode liquid crystal element according to claim 66, wherein columns are formed at a predetermined site as spacers for holding a fixed spacing between the substrates of the in-plane electric field mode liquid crystal element.

69. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein no insulating film is formed on at least a portion of the liquid crystal side of at least one of the pixel electrodes, the common electrodes, and the signal lines, whereby these electrodes or lines are insulating film open electrodes contacting the liquid crystal directly; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the pixel electrodes and the common electrodes have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

70. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the pixel electrodes are open pixel electrodes, in which no insulating film has been formed at all, so that at these portions the pixel electrodes contact the liquid crystal directly or via only an orientation film of not more than 500 Å; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the pixel electrodes, etc., have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

71. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein no insulating film has been formed at all on the common electrodes, so that at these portions the common electrodes are open common electrodes, in which the pixel electrodes contact the liquid crystal directly or via only an orientation film of not more than 500 Å; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the common electrodes, etc., have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

72. (Amended) An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the pixel electrodes and the common electrodes are, respectively, open pixel electrodes and open common electrodes, in which no insulating film to the liquid crystal layer has been formed at all, so that at these portions they contact the liquid crystal directly or via only an orientation film of not more than 500 Å; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the pixel electrodes and common electrodes have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

73. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 69, wherein the liquid crystal layer of the in-plane electric field mode liquid crystal element uses a liquid crystal with a specific resistance of 10^{12} to $10^{13} \Omega \cdot \text{cm}$.

74. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 69, including a positive potential applying means for applying, to the neutralization electrode, a positive potential with respect to a minimum voltage level of the scanning line.

75. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 69, wherein the neutralization electrode is an equipotential neutralization electrode that has been set to the same potential as the common electrode.

76. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 69, wherein the neutralization electrode is a light-blocking film combined neutralization electrode that also serves as a light-blocking film.

77. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 69, wherein the neutralization electrode is a color filter combined neutralization electrode that also serves as a color filter.

78. (Twice Amended) The in-plane electric field mode liquid crystal element according to claim 69, wherein the insulating film has not been formed on a top portion of one of the pixel electrodes, the common electrodes, or the signal electrodes, so that the portion without the insulating film faces the liquid crystal layer via only the orientation film; and

wherein the orientation film is made of a resin-based conductive substance.

79. (Amended) The in-plane electric field mode liquid crystal element according to claim 76, comprising a positive potential applying means for applying, to the neutralization electrode, a positive potential with respect to a minimum voltage level of the scanning line.

80. (Amended) The in-plane electric field mode liquid crystal element according to claim 77, comprising a positive potential applying means for applying, to the neutralization electrode, a positive potential with respect to a minimum voltage level of the scanning line.

81. (Amended) The in-plane electric field mode liquid crystal element according to claim 76, wherein the neutralization electrode is an equipotential neutralization electrode that has been set to the same potential as the common electrode.

82. (Amended) The in-plane electric field mode liquid crystal element according to claim 77, wherein the neutralization electrode is an equipotential neutralization electrode that has been set to the same potential as the common electrode.

83. (Amended) A method for manufacturing an in-plane electric field mode liquid crystal element having a pair of substrates including, on at least one of the substrates, pixel electrodes for generating an in-plane electric field, common electrodes, and an insulating film for insulating, etc., these electrodes from one another, and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates; the method for manufacturing an in-plane electric field mode liquid crystal element, comprising:

an orientation film removal step of removing a predetermined portion of the orientation film once formed on the inner side of the two substrates.

84. (Amended) A method for manufacturing an in-plane electric field mode liquid crystal element having a pair of substrates including, on at least one of the substrates, pixel electrodes for generating an in-plane electric field, common electrodes, and an insulating film for insulating, etc., these electrodes from one another, and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates; the method for manufacturing an in-plane electric field mode liquid crystal element, comprising:

an orientation film removal step of removal, by etching, of a predetermined portion of the orientation film once formed on the inner side of the two substrates; and

an orientation step of performing an orientation process to the remaining orientation film.

85. (Amended) A method for manufacturing an in-plane electric field mode liquid crystal element having a pair of substrates including, on at least one of the substrates, pixel electrodes for generating an in-plane electric field, common electrodes, and an insulating film for insulating, etc., these electrodes from one

Serial No.: 10/089,888 (PCT/JP00/07011)

another, and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates; the method for manufacturing an in-plane electric field mode liquid crystal element, comprising:

a stripping step of stripping, by rubbing, a predetermined portion of the orientation film on the electrodes or the lines once formed on the inner side of the two substrates.

86. (Amended) The method for manufacturing an in-plane electric field mode liquid crystal element according to claim 85, wherein the stripping step is a push rubbing stripping step wherein the pushing amount during rubbing is at least 0.5 mm.

88. (Amended) A method for manufacturing an in-plane electric field mode liquid crystal element including a pair of substrates on which are formed, on at least one of the substrates, pixel electrodes, common electrodes, signal lines and scanning lines corresponding to these electrodes, and an insulating film for insulating;

and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates, the method for manufacturing an in-plane electric field mode liquid crystal element comprising:

a light-blocking film formation step of forming a light-blocking film made of a conductive substance at a predetermined location on the other substrate;

an over-coating layer material selection step of selecting a photosensitive material as the material of an over-coating layer of the light-blocking film;

an over-coating layer formation step of forming an over-coating layer with the selected photosensitive material; and

an over-coating layer portion stripped portion formation step using photolithography of forming, by photolithography, on the over-coating material layer on the conductive light-blocking film a region in which there is no over-coating layer on the light-blocking film.

90. (Amended) A method for manufacturing an in-plane electric field mode liquid crystal element, comprising:

a first conductive layer formation step of forming, at a predetermined location on a first substrate, an opposing electrode and a scanning line also serving as a gate of a transistor made of a metal layer;

a first insulating film formation step of forming a first insulating film on the scanning line and the opposing electrode that are formed;

a semiconductor layer formation step of forming a semiconductor layer at a predetermined location;

a second conductive layer formation step of forming a signal line and a pixel electrode at predetermined locations; and

a second insulating film formation step of forming a second insulating film only on a switching element made of the semiconductor layer formed at the predetermined location.